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FORECAST OF THE CHIGNIK RIVER RED SALMON RUN IN 1965

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INTRODUCTION

Chignik sockeye salmon runs during the past ten years have ranged in size from 646,000 to 1,425,000 and averaged approximately 875,000 annually. The Fisheries Research Institute first began forecasting these runs in 1958 and was joined by the Alaska Department of Fish and Game in 1961 in an effort to consolidate the collection and evaluation of existing data. The method of prediction outlined here is based on adult return analyses and nursery lake studies of the Chignik watershed. Predictions of sockeye runs to the Chignik District in 1962-64 were published as Informational Leaflet No. 13, 24, and 38 by the Alaska Department of Fish and Game

FORECAST

The adult sockeye salmon runs returning to Chignik consist mainly of fish which have spent three winters at sea (.3 fish) along with a much smaller number which have spent two winters at sea (.2 fish). The relationship between returns of .2 fish to .3 fish (Tables 1 and 2) of each parent year class for which we have data appeared to follow a linear trend up until the last few years (Figures 1 and 2). Previous forecasts were made on the basis of this trend (Table 3).

The 1964 return of early fish was far below the value estimated from the regression of age .3 fish on age .2 fish. Possible sources of error in the above forecast were: (1) inadequate commercial fishery scale samples during June, 1963, (2) differential ocean survival between age .2 fish returning in 1963 and age .3 fish returning in 1964 and (3) relationship between age .2 and age .3 fish may not follow a linear trend when large numbers of age .2 fish from a given year class as they did in 1963. The 1964 return was considered an outlier and hence not included in the calculations for the early run given in Figure 1. The forecast of 570,000 for the late return in 1964 was quite close (4.6 percent relative error) to the observed return.

Since the relationship of age .2 fish return to age .3 fish return one year later has become less reliable during the past few years we plan to include both return analyses and juvenile analyses in the forecast technique. Consideration

Table 1. Early return (prior to June 30) of age .3 sockeye and age .2 sockeye for the previous year, Chignik, 1956-64.

Year of age .3 return	Total age .2 return	Total age .3 return
1956	37,700	419,000
1957	7,500	183,000
1958	2,600	151,000
1959	13,600	165,000
1960	40,700	593,000
1961	18,500	212,000
1962	26,700	263,000
1963	34,200	243,000
(1964)[1]	75,100	146,000

[1] Not used in regression equation.

Table 2. Late run (after June 30) of age .3 sockeye and age .2 sockeye of the previous year, Chignik, 1956-64.

Year of age .3 return	Total age .2 return	Total age .3 return
1956	54,000	882,000
1957	34,000	550,000
1958	44,000	430,000
1959	50,000	475,000
1960	112,000	624,000
1961	52,000	431,000
1962	47,000	377,000
1963	113,000	408,000
1964	166,000	451,000

Table 3. Chignik forecasts, 1958 - 1964.

Year	Predicted return	Actual return	Percent relative error
1958	621,000	646,000	3.9
1959	834,000	827,000	0.8
1960	1,900,000	1,285,000	47.9
1961	795,000	721,000	10.3
1962	940,000	801,000	17.4
1963	1,348,000	906,000	48.8
1964	1,340,000[1]	739,000	81.3

[1] Qualified on basis of contradictory evidence from lake studies.

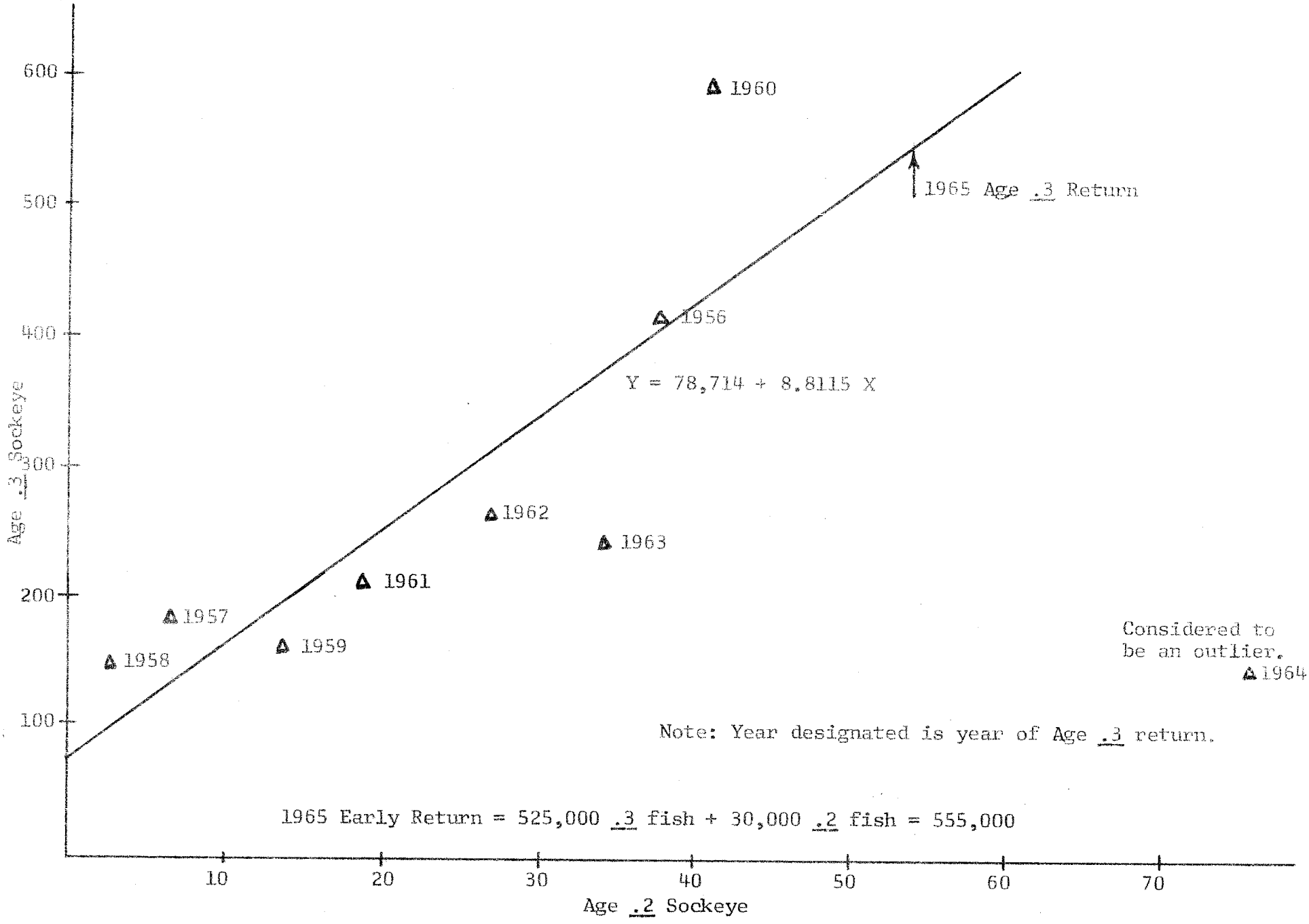

Figure 1. Regression of age .3 sockeye and age .2 sockeye of previous year for early run (prior to June 30), Chignik, 1956-64. (Number of fish in thousands).

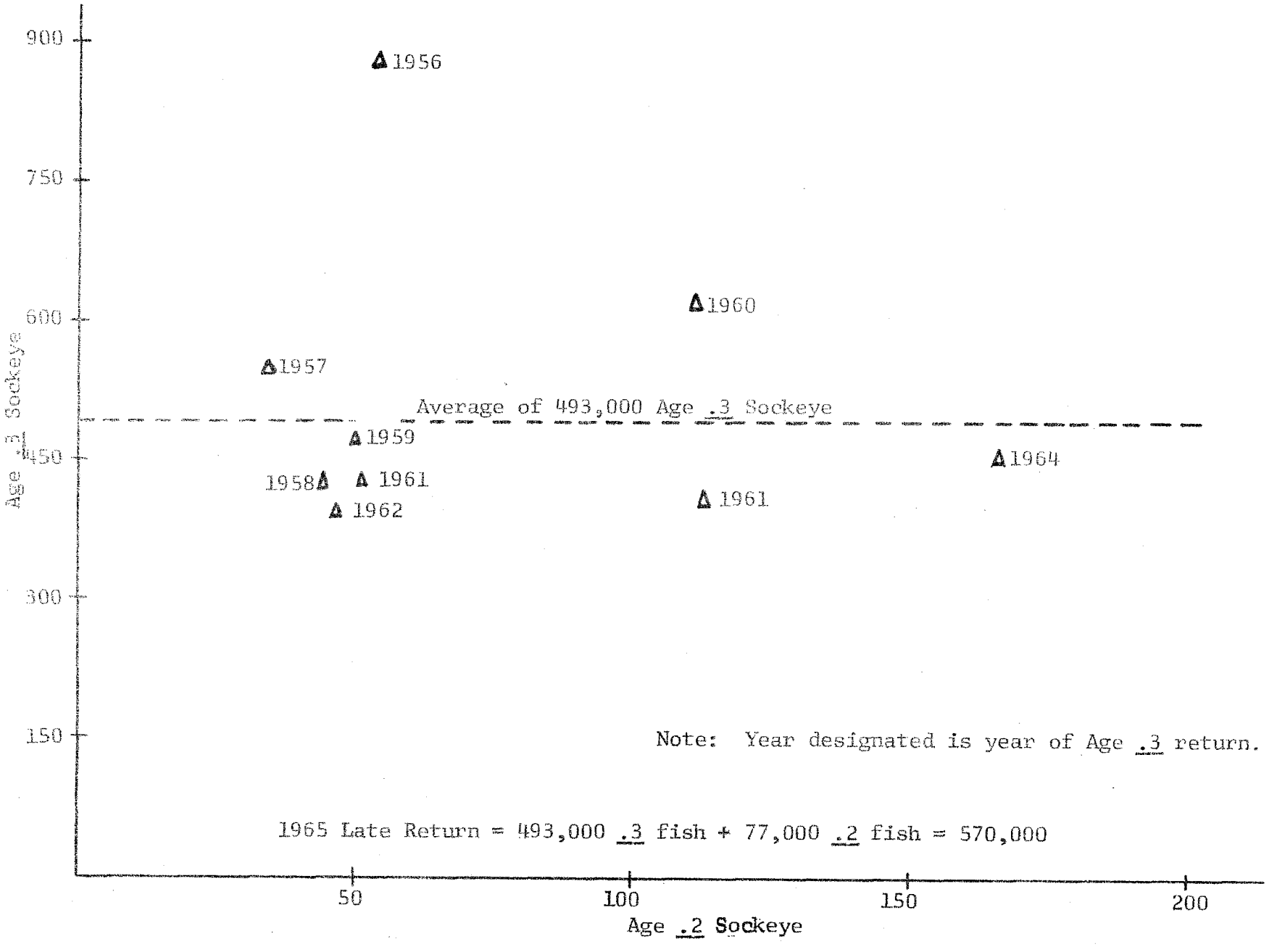

Figure 2. Relationship between age .3 sockeye and age .2 sockeye of the previous year for late run (after June 30), Chignik, 1956-64. (Numbers of fish in thousands).

of data concerning both past and present runs along with young fish studies since 1960 should provide a more accurate method of forecasting future returns.

Adult Return Analyses

Starting in 1964 the prediction was split into two segments based on our knowledge of time of entry of the two major spawning groups: (1) the early run (through June 30) which is destined largely for the spawning tributaries of Black Lake and (2) the late run (after June 30) which is bound for the spawning areas of Chignik Lake.

The previous forecast method consisted of estimating the early run age .3 fish on the basis of the regression of age .3 sockeye on the .2 sockeye of the previous year. The estimate for the late run age .3 fish was based on an arithmetic average of late run age .3 fish in past years. For both the early and late run, the prediction of age .2 sockeye was based on arithmetic averages of age .2 sockeye returning in past years. On the basis of this method a total return of nearly 1,125,000 sockeye is expected in 1965. Of this total, 555,000 fish are expected prior to June 30 (mainly Black Lake reared fish) and 570,000 fish after June 30 (mainly Chignik Lake reared fish). We indicated above that this method of estimation has been less reliable during the last two seasons; however, it does give us a reference point for our analyses outlined below.

The total late run (July 1 on) of all ages during the past 10 years has been rather constant, ranging from a low of 354,000 in 1955 to a high of 675,000 in 1960 except for the year 1956 when the return was 916,000 (Figure 3). Thus it seems reasonable to expect simply an average return for this period which (rounded off) is 570,000.

The total early return has been quite variable during this same period of time, ranging from a low of 185,000 in 1957 to a high of 611,000 in 1960 with an average return of 300,000 fish (Figure 4). The above predicted return of 555,000 fish through the end of June, 1965, appears to be consistent with the parent year class escapement. Progeny of the 1960 year class, which were reared in Black Lake, will make up the bulk of the return in June, 1965. The 1960 escapement to Black Lake (offspring of a large escapement in 1956) was the highest on record during the last 10 years, thus we would expect a sizable return of adults in June of 1965. Spawning ground scale analyses give further supporting evidence of the above expected return. The lacustrine growth pattern of adult age 1.2 fish returning to Black Lake spawning tributaries in 1964 was very similar to that of the abundant age 1.3 fish which returned in 1960. The scale growth pattern of both groups showed the effect of large juvenile populations during the lake residency. Therefore, on the basis of scale growth studies, the age 1.2 fish return in 1964 indicates that a large population of young fish was present during the lake residency of the 1960 offspring. Since few fish from this population returned as age 1.2 fish in 1964 we expect a good return of age 1.3 fish in 1965.

Nursery Lake Studies

Juvenile fish studies conducted at Chignik by the Fisheries Research Institute since 1960 indicate a very large population of sockeye salmon fry was present in

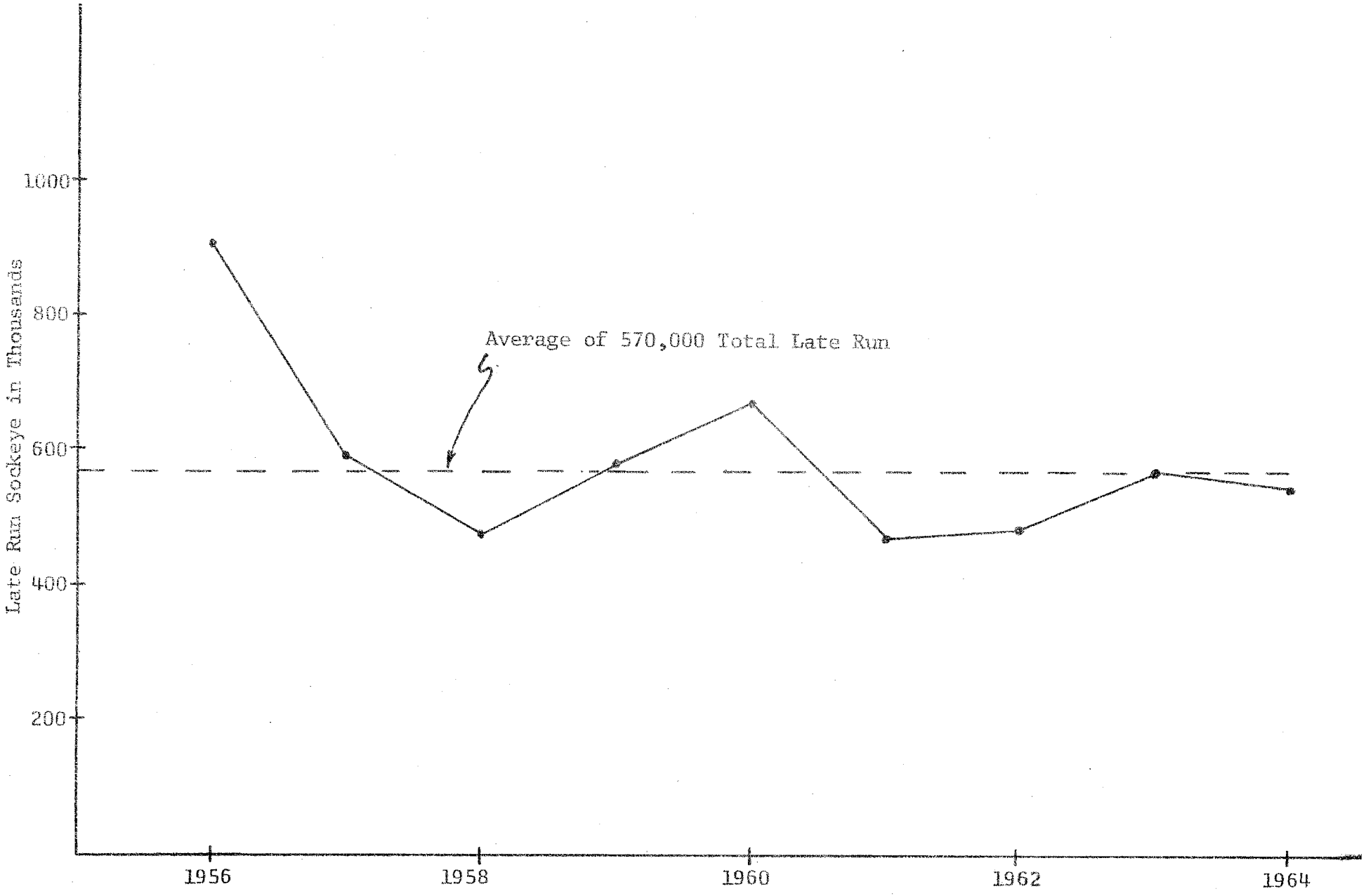

Figure 3. Total late sockeye run by year, Chignik, 1956-64.

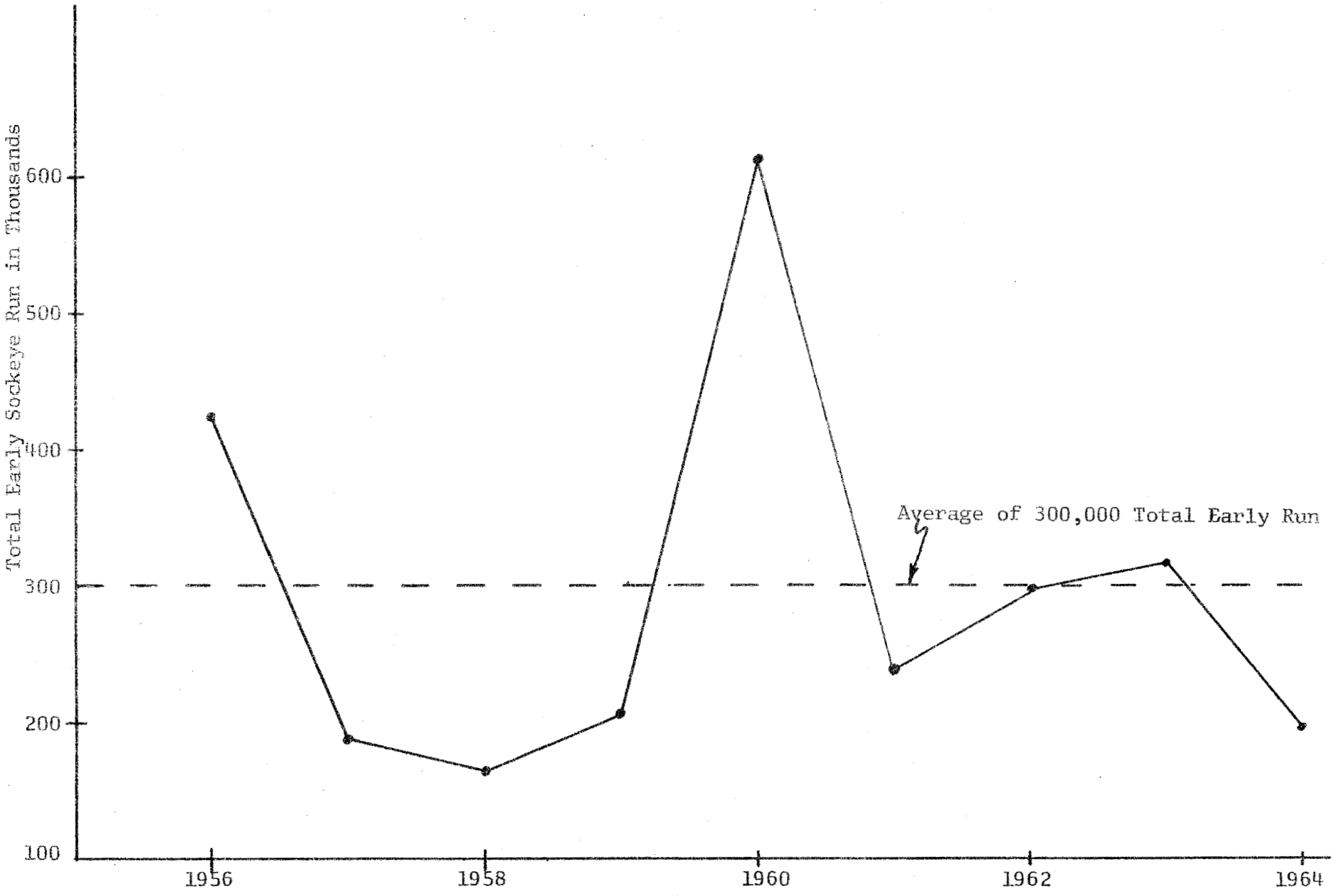

Figure 4. Total early (prior to June 30) sockeye return by year, Chignik, 1956-64.

1961 consistent with the large escapement to Black Lake in 1960. Tow net catches in Black Lake during 1961 were the largest observed to date in either lake (Table 4). Growth studies of sockeye salmon fry in Black Lake during the same year also indicated the presence of a large population. A more complete analysis of nursery area studies is given by Narver and Dahlberg (1964).

SUMMARY

The outlook for a sizable return of adult sockeye salmon to Chignik in 1965 appears good. All of our studies indicate a much better than average return during June. The return from July 1 on has been consistent over the past several years and we expect this to continue through 1965.

The two principal sources of possible error in the forecast this year are: (1) we have no measure of marine survival, hence the large sockeye salmon fry population observed in 1961 may not produce a large early run of adults in 1965, and (2) the incidental harvest of sockeye salmon bound for Chignik at other places along the Alaska Peninsula. Tagging studies and catch records have indicated the Stepovak Bay and Cape Kumlik fisheries may take a portion of the run bound for Chignik.

In summary then we would expect the early run (through June 30) to be in the neighborhood of 600,000 fish, similar to the 1960 return, and the late run (after June 30) to be approximately 570,000 fish for a total run of around 1,200,000 sockeye salmon.

LITERATURE CITED

Narver, D.W. and M.L. Dahlberg. 1965. Chignik sockeye salmon studies. Research in Fisheries, 1964. College of Fisheries, University of Washington, Seattle, Wash. (In press).

Table 4. Tow net catches of sockeye salmon fry and fingerling[1].

Location	Year 1961	1962	1963	1964
Black Lake				
Fry	235	45	125	112
Fingerling	0	0	1	2
Chignik Lake				
Fry	146	29[2]	105	138
Fingerling	70	102	90	40

[1] Expressed as mean catch per standard 5 minute tow, weighted by lake area.

[2] The entire Chignik Lake sockeye fry population does not become pelagial until late summer. There is some evidence that the 1962 fry were exceptionally late in moving offshore.

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